

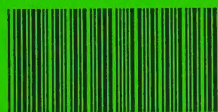
Operating Instructions

G. QUIRK. TEST GEAR.
R.F. ATTENUATOR

Type TF 1073A/1

and TF 1073A/

MP MASTER



MA23682

MARCONI INSTRUMENTS LIMITED, ENGLAND

OPERATING INSTRUCTIONS

for

R.F. ATTENUATOR

(formerly, 100- dB Step Attenuator)

TYPES TF 1073A and TF 1073A/1

APPENDICES

FUNCTIONAL DIAGRAM

CIRCUIT DIAGRAM

AND COMPONENT LIST

OR

CIRCUIT DIAGRAM

AND COMPONENT LIST

UNITS COMPARISON TABLE

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FUNCTIONAL DIAGRAM	TBB 23866
CIRCUIT DIAGRAM) for TF 1073A	TC 23558/1
and COMPONENT LISTS)	
OR	
CIRCUIT DIAGRAM) for TF 1073A/1	TC 23558/2
and COMPONENT LISTS)	
DECIBEL CONVERSION TABLE	OM'G-SUPP dB

SCHEDULE OF PARTS SUPPLIED

The complete equipment comprises the following items:-

1. One R.F. Attenuator Type TF 1073A or TF 1073A/1.
2. Two Coaxial Free Plugs, BNC; 75 ohms, Transradio Type BN. 1/7 - PT 1YM (a modified Type BN. 1/7 to accept double-screened cable) for TF 1073A; 50 ohms, Transradio Type BN. 1/5 (un-modified) for TF 1073A/1.
3. One Operating Instructions No. EB 1073A - A/1.

DATA SUMMARY

for

R.F. Attenuator Types TF 1073A & A/1

Serial No. JA276/001 and above

ATTENUATION RANGE:	100 dB, in 1-dB steps. Provided by coarse and fine controls; one giving 80 dB in 20-dB steps; the other giving 20 dB in 1-dB steps.		
FREQUENCY RANGE:	0 to 100 Mc/s; usable to 150 Mc/s with reduced accuracy.		
CHARACTERISTIC IMPEDANCE:	TF 1073A: 75 ohms. TF 1073A/1: 50 ohms.		
ACCURACY AT 100 MC/S:	Each step of the coarse section introduces $20 \text{ dB} \pm 0.2 \text{ dB}$, but the cumulative error due to these steps never exceeds $\pm 0.5 \text{ dB}$. Each step of the fine section is independent and introduces the nominal attenuation $\pm 0.2 \text{ dB}$.		
POWER INPUT:	Inputs up to a maximum of 0.25 watt can be applied.		
DIMENSIONS (over projections):	Height 8 in (20.5 cm)	Width $10\frac{1}{2}$ in (26.5 cm)	Depth 7 in (18 cm)
WEIGHT:	$7\frac{1}{2}$ lb (3.4 kg)		

DESCRIPTION

1.1. GENERAL

The TF 1073A and TF 1073A/1 r.f. attenuators are variable in 1-dB steps from 0 to 100 dB. They are direct reading without the use of correction charts, having a frequency characteristic sensibly flat well into the v.h.f. range. The TF 1073A had a characteristic impedance of 75 ohms, and the A/1 50 ohms.

Two separate sections in cascade form the basis of the attenuator; the degree of reduction of signal level through the sections is determined by the settings of two rotary controls calibrated in decibels. The first section has an attenuation range of 80 dB in 20-dB steps and the second a range of 20 dB in 1-dB steps; resistive networks of high accuracy are employed throughout. At minimum attenuation, the sections are switched to positions where a direct through connection is obtained with no shunt loading. Coaxial input and output plugs are provided for connection of the attenuator between source and load.

1.2. DESIGN DETAILS

The two attenuating sections comprising the 100-dB Step Attenuator are enclosed within separate screening covers contained in the outer case. The first, or 80-dB section, utilizes four successively-switched, additive, π -type networks, each of 20 dB. The second, or 20-dB section, contains twenty different networks producing, independently, attenuations from 1 to 20 dB in steps of 1 dB, only one network being in circuit for any given switch position; the 1-dB and 2-dB networks are of the T type, and the remaining eighteen are π networks.

The networks of both sections are switched so that clockwise rotation of the control knobs produces a decrease in attenuation, i.e., an increase in output; in this respect, the controls function in a similar manner to those normally found on the attenuators of signal generators. At the fully-clockwise position of the switches, all the attenuating networks are completely withdrawn from circuit, leaving a direct connection between the input and output plugs; this condition presents an insertion loss which is low at v.h.f. and which becomes virtually zero at lower frequencies.

2.

OPERATION

2.1. INPUT AND OUTPUT SOCKETS - SUITABLE CABLES

Connection is made to the Attenuator by means of type BNC free plugs. The 75-ohm plugs for the TF 1073A are Transradic type BN.1/7-PTIYM, which are standard BNC types modified to accept double-screened low-capacitance cable such as Telcon PTIYM. The 50-ohm plugs for the TF 1073A/1 are unmodified Transradio type BN.1/5, which will accept double-screened cable available from Transradio Ltd. under the code RG-58A/U (Double-Screened).

2.2. CONNECTING SOURCE TO ATTENUATOR INPUT

When connecting the source to the input of the Attenuator, the connecting cable should be kept as short as possible; it is recommended that the length of cable should not be more than 10 inches. Furthermore, it is important that the inner and outer screens of the cable, as well as being shorted together and earthed on the plug at the Attenuator panel, should also be shorted together and earthed at the source end of the cable.

Although symmetrical networks are used, the input and output connections must not be reversed or earth currents flowing in the chassis may introduce serious errors.

2.3. CONNECTING ATTENUATOR OUTPUT TO LOAD

It is advisable, if accurate results are to be obtained, to make sure that the lead is correctly terminated in a resistive load of 75 or 50 ohms as appropriate. This applies particularly when high-frequency measurements are being made, because any significant mismatch may set up standing waves in the output cable so that the impedance presented to the output socket is seriously different from the characteristic impedance, R_0 , of the attenuator and has a considerable reactive component. This effect can be minimized by keeping the output lead as short as possible.

2.3. (continued)

The above precaution becomes very important in the special case where the impedance of the source feeding the attenuator is not equal to R_o and the attenuator setting is such that only one pad is in circuit, i.e., when the setting is 20 dB or less. Under these conditions, the image impedance at the output plug of the attenuator is not R_o , so that, if the load resistance is also other than R_o , the output cable is not correctly terminated at either end.

2.4. GENERAL

The total attenuation in decibels is the sum of the settings of the two switch controls. When both controls are set to 0 dB, the insertion loss of the Attenuator is less than 0.5 dB at frequencies up to 100 Mc/s.

Input powers up to a maximum of 0.25 watt may be applied to the Attenuator. This represents a level of over 4 volts r.m.s. at 75 ohms, or 3.5 volts at 50 ohms.

3.

MAINTENANCE

3.1 REMOVAL OF CASE

To gain access to the interior of the instrument:-

- (a) Lay the instrument face downwards.
- (b) Unscrew the two cheese-head fixing bolts from the back panel.
- (c) Lift the entire outer case, thereby exposing the chassis of the instrument.

3.2 DISMANTLING THE ATTENUATORS

3.2.1 0- to 80-dB Attenuator

The 0- to 80-dB attenuator is a totally-enclosed sub-assembly. To gain access to its interior, the most practicable and satisfactory course is to first detach it from the front panel. To do this:-

- (1) Remove the control knob after slackening the two grub-screws which secure the knob to the switch spindle.
- (2) Detach the two 6-BA cheese-headed screws thus exposed and also the nut securing the switch spindle to the insulating panel.
- (3) Remove the INPUT socket, if deemed necessary for ease of maintenance, by removing the 6-BA nuts and screws securing the socket to the front panel.

With the attenuator freed from the front panel, its screening covers can now be removed as follows :-

- (1) Slacken the four 6-BA cheese-headed screws which secure the flat plate to the main body of the attenuator.
- (2) Remove the studding which passes through the centre of the two parallel sides of the U-shaped screening cover.

3.2.1 (continued)

- (3) Unscrew the fourteen self-tapping screws located at the ends of the main body of the attenuator and remove the U-shaped screening cover.

To replace the attenuator, the above procedure should be reversed. When re-assembling the attenuator, particular care should be taken to ensure (i) that the flanges of the U-shaped screening cover are inserted between the main body of the attenuator and the foil underneath the flat screening plate and not between the foil and the flat plate, (ii) that the studding which passes through the two parallel sides of the U-shaped screening cover is as tight as possible to maintain good screening between the individual sections of the switch, and (iii) that the two 6-BA screws and the spindle nut securing the main body of the attenuator to the insulating panel do not touch the case.

3.2.2 0- to 20-dB Attenuator

The 0- to 20-dB attenuator is also a totally-enclosed sub-assembly. Partial access to the interior may be gained by removing its rear screening cover by means of the three cheese-headed screws. To gain complete access to the interior of the attenuator, it is necessary to detach the whole sub-assembly from the front panel. To do this:-

- (1) Remove the control knob after slackening the two grub screws which secure the knob to the switch spindle.
- (2) Unscrew the three instrument-headed screws thus exposed.
- (3) Remove the OUTPUT socket if deemed necessary for ease of maintenance, by removing the 6-BA nuts and screws securing the socket to its insulating panel.

With the attenuator now free from the front panel the forward part of its screening cover can be removed, as follows:-

- (1) Take out the three 2-BA countersunk screws which clamp the cover between the switch and the attenuator mounting plate.

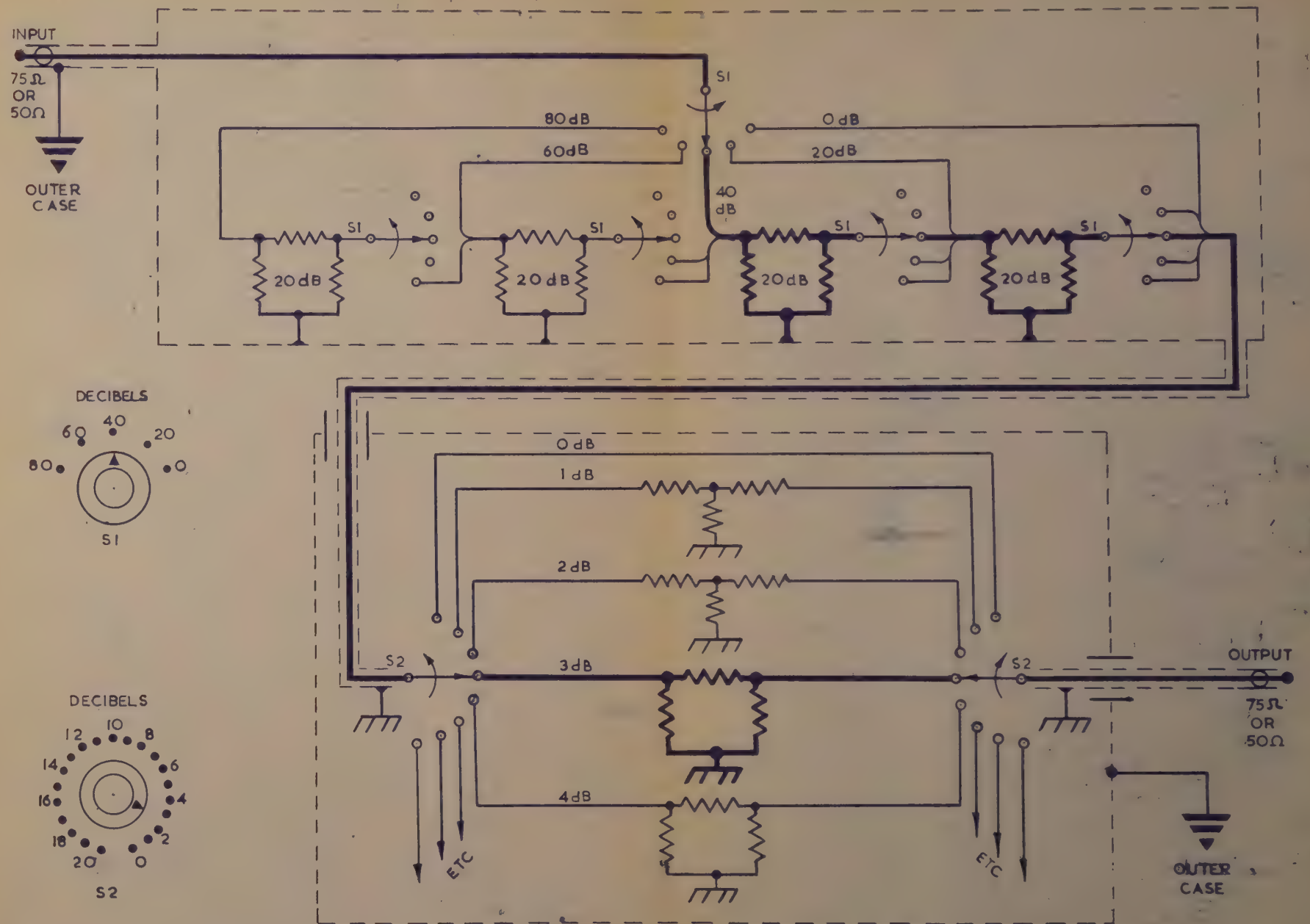
- (2) Remove the 6-BA nut and screw that secures the solder tag to the screening cover.

To replace the attenuator, the above procedure should be reversed. When replacing the attenuator, make sure that the screens of its input and output cables do not touch the outer screening covers of the attenuator.

FUNCTIONAL DIAGRAM
OF
R.F. ATTENUATOR

TYPES TF1073, TF1073A & A/1

FOLD UNDER



FUNCTIONAL DIAGRAM OF R.F. ATTENUATOR TYPES TF1073, TF1073A & A/1

MARCONI INSTRUMENTS LIMITED

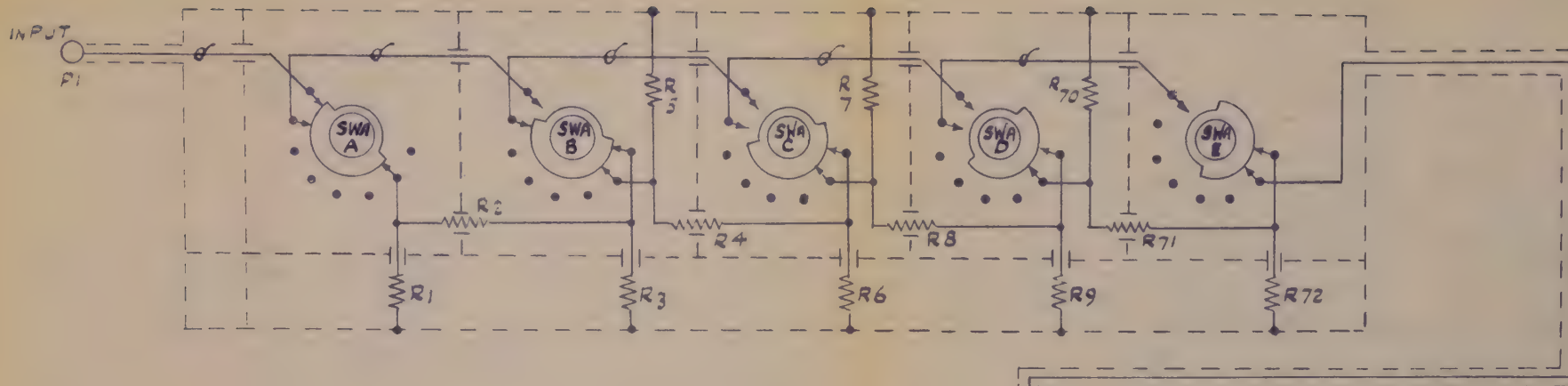
DRN	W.R.C.	DATE	11-6-54	TRACED	H.F.	CHECKED	D.F.B.
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STOCK LIST

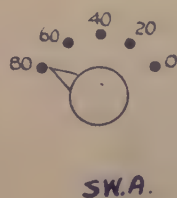
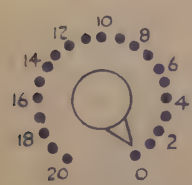
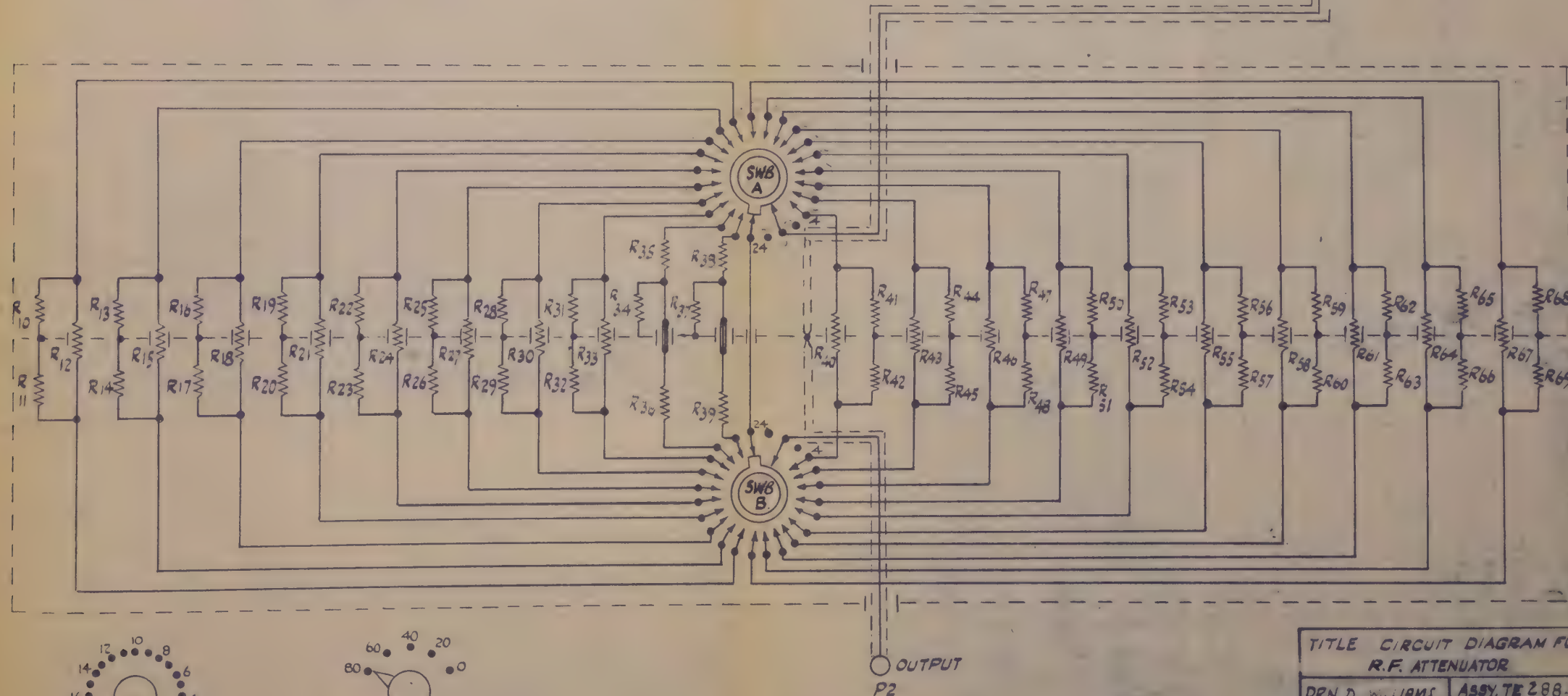
TF 1073

DRG No

TBB23866



SHORTING LINK BETWEEN EACH
SWITCH WAFER MARKED THUS 0
TO BE WIRED WITH 18 SWG TINNED
CU. WIRE & COVERED WITH SUITABLE
NEOPRENE SLEEVING



TITLE CIRCUIT DIAGRAM FOR
R.F. ATTENUATOR

DRN. D. WILLIAMS	ASSY. TE 288-5
DATE 13.8.58	S. LIST. TF 1073A/1
CHK	SCALE -
APP. E.G.	DRAWING NO. SHT 1.
TRACED	TC 23558/22 SHTS.

MARCONI INSTRUMENTS LTD.

REF	RESISTORS	S LIST	REF	RESISTORS	S LIST	REF	S LIST
R1	247.5Ω ± 1% 1/4W	17/TM4923/2	R38	288Ω ± 2% 1/4W	9/TM4924/2		
R2	247.5Ω ± 1% 1/4W	17/TM4923/2	R39	288Ω ± 2% 1/4W	9/TM4924/2		
R3	61.1Ω ± 1% 1/4W	18/TM4923/2	R40	247Ω ± 1% 1/4W	48/TM4924/2		
R4	247.5Ω ± 1% 1/4W	17/TM4923/2	R41	61.1Ω ± 1% 1/4W	49/TM4924/2		
R5	61.1Ω ± 1% 1/4W	18/TM4923/2	R42	61.1Ω ± 1% 1/4W	49/TM4924/2		
R6	61.1Ω ± 1% 1/4W	18/TM4923/2	R43	220Ω ± 1% 1/4W	40/TM4924/2		
R7	61.1Ω ± 1% 1/4W	18/TM4923/2	R44	62.6Ω ± 1% 1/4W	47/TM4924/2		
R8	247.5Ω ± 1% 1/4W	17/TM4923/2	R45	62.6Ω ± 1% 1/4W	47/TM4924/2		
R9	61.1Ω ± 1% 1/4W	18/TM4923/2	R46	195.4 ± 1% 1/4W	44/TM4924/2		
R10	96.3Ω ± 1% 1/4W	29/TM4924/2	R47	64.4 ± 1% 1/4W	45/TM4924/2		
R11	96.3Ω ± 1% 1/4W	29/TM4924/2	R48	64.4 ± 1% 1/4W	45/TM4924/2		
R12	7.2Ω ± 1% 1/4W	28/TM4924/2	R49	173.3Ω ± 1% 1/4W	42/TM4924/2		
R13	106Ω ± 1% 1/4W	27/TM4924/2	R50	66.6Ω ± 1% 1/4W	43/TM4924/2		
R14	106Ω ± 1% 1/4W	27/TM4924/2	R51	66.6Ω ± 1% 1/4W	43/TM4924/2		
R15	61.6Ω ± 1% 1/4W	26/TM4924/2	R52	153.7Ω ± 1% 1/4W	40/TM4924/2		
R16	116.2Ω ± 1% 1/4W	23/TM4924/2	R53	68.9Ω ± 1% 1/4W	41/TM4924/2		
R17	116.2Ω ± 1% 1/4W	23/TM4924/2	R54	68.9Ω ± 1% 1/4W	41/TM4924/2		
R18	52.9Ω ± 1% 1/4W	24/TM4924/2	R55	36Ω ± 1% 1/4W	38/TM4924/2		
R19	30.7Ω ± 1% 1/4W	22/TM4924/2	R56	71.7Ω ± 1% 1/4W	39/TM4924/2		
R20	130.7Ω ± 1% 1/4W	22/TM4924/2	R57	71.7Ω ± 1% 1/4W	39/TM4924/2		
R21	44.8Ω ± 2% 1/4W	21/TM4924/2	R58	120.4Ω ± 1% 1/4W	36/TM4924/2		
R22	150.5Ω ± 1% 1/4W	19/TM4924/2	R59	75Ω ± 1% 1/4W	37/TM4924/2		
R23	150.5Ω ± 1% 1/4W	19/TM4924/2	R60	75Ω ± 1% 1/4W	37/TM4924/2		
R24	37.4Ω ± 2% 1/4W	20/TM4924/2	R61	106Ω ± 1% 1/4W	34/TM4924/2		
R25	178.7Ω ± 1% 1/4W	18/TM4924/2	R62	78.9Ω ± 1% 1/4W	35/TM4924/2		
R26	178.7Ω ± 1% 1/4W	18/TM4924/2	R63	78.9Ω ± 1% 1/4W	35/TM4924/2		
R27	30.5Ω ± 2% 1/4W	17/TM4924/2	R64	93.2Ω ± 1% 1/4W	32/TM4924/2		
R28	221.4Ω ± 1% 1/4W	16/TM4924/2	R65	83.6Ω ± 1% 1/4W	33/TM4924/2		
R29	221.4Ω ± 1% 1/4W	16/TM4924/2	R66	83.6Ω ± 1% 1/4W	33/TM4924/2		
R30	23.9Ω ± 2% 1/4W	15/TM4924/2	R67	81.7Ω ± 1% 1/4W	30/TM4924/2		
R31	293Ω ± 1% 1/4W	14/TM4924/2	R68	89.3Ω ± 1% 1/4W	31/TM4924/2		
R32	293Ω ± 1% 1/4W	14/TM4924/2	R69	89.3Ω ± 1% 1/4W	31/TM4924/2		
R33	17.63Ω ± 2% 1/4W	13/TM4924/2	R70	61.1Ω ± 1% 1/4W	18/TM4923/2		
R34	216.5 ± 1% 1/4W	12/TM4924/2	R71	247.5Ω ± 1% 1/4W	17/TM4923/2		
R35	5.74Ω ± 2% 1/4W	10/TM4924/2	R72	61.1Ω ± 1% 1/4W	18/TM4923/2		
R36	5.74Ω ± 2% 1/4W	10/TM4924/2					
R37	434Ω ± 1% 1/4W	11/TM4924/2					

SWITCHES

SWA 5 POSNS. 5 SECTIONS 1/TM4923/2
SWB 21 POSNS. 2 SECTIONS 1/TM4924/2

PLUGS

P1 CO-AXIAL 35/TM4923/1
P2 CO-AXIAL 61/TM4924/2

TITLE		CIRCUIT DIAGRAM FOR R.F. ATTENUATOR	
DRAWN		2. WILLIAMS	
DATE		13-8-58	
CHKD.		---	
APP		---	
TRACED		---	
ASSY.		TE28845	
WIRING		---	
S LIST		TF1073A/1	
DRG. NO		TC23558/2 OF 2	
SHT 2		---	
MARCONI INSTRUMENTS LTD.			

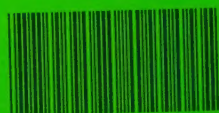
DECIBEL CONVERSION TABLE

Ratio Down			Ratio Up	
VOLTAGE	POWER	DECIBELS	VOLTAGE	POWER
1.0	1.0	0	1.0	1.0
.9886	.9772	.1	1.012	1.023
.9772	.9550	.2	1.023	1.047
.9661	.9333	.3	1.035	1.072
.9550	.9120	.4	1.047	1.096
.9441	.8913	.5	1.059	1.122
.9333	.8710	.6	1.072	1.148
.9226	.8511	.7	1.084	1.175
.9120	.8318	.8	1.096	1.202
.9016	.8128	.9	1.109	1.230
.8913	.7943	1.0	1.122	1.259
.8710	.7586	1.2	1.148	1.318
.8511	.7244	1.4	1.175	1.380
.8318	.6918	1.6	1.202	1.445
.8128	.6607	1.8	1.230	1.514
.7943	.6310	2.0	1.259	1.585
.7762	.6026	2.2	1.288	1.660
.7586	.5754	2.4	1.318	1.738
.7413	.5495	2.6	1.349	1.820
.7244	.5248	2.8	1.380	1.905
.7079	.5012	3.0	1.413	1.995
.6683	.4467	3.5	1.496	2.239
.6310	.3981	4.0	1.585	2.512
.5957	.3548	4.5	1.679	2.818
.5623	.3162	5.0	1.778	3.162
.5309	.2818	5.5	1.884	3.548
.5012	.2512	6	1.995	3.981
.4467	.1995	7	2.239	5.012
.3981	.1585	8	2.512	6.310
.3548	.1259	9	2.818	7.943
.3162	.1000	10	3.162	10.000
.2818	.07943	11	3.548	12.59
.2512	.06310	12	3.981	15.85
.2239	.05012	13	4.467	19.95
.1995	.03981	14	5.012	25.12
.1778	.03162	15	5.623	31.62

DECIBEL CONVERSION TABLE

Ratio Down			Ratio Up		
VOLTAGE	POWER	DECIBELS	VOLTAGE	POWER	
·1585	·02512	16	6·310	39·81	
·1413	·01995	17	7·079	50·12	
·1259	·01585	18	7·943	63·10	
·1122	·01259	19	8·913	79·43	
·1000	·01000	20	10·000	100·00	
·07943	·006310	22	12·59	158·5	
·06310	·003981	24	15·85	251·2	
·05012	·002512	26	19·95	398·1	
·03981	·001585	28	25·12	631·0	
·03162	·001000	30	31·62	1,000	
·02512	·0006310	32	39·81	1,585	
·01995	·0003981	34	50·12	2,512	
·01585	·0002512	36	63·10	3,981	
·01259	·0001585	38	79·43	6,310	
·01000	·0001000	40	100·00	10,000	
·007943	·00006310	42	125·9	15,850	
·006310	·00003981	44	158·5	25,120	
·005012	·00002512	46	199·5	39,810	
·003981	·00001585	48	251·2	63,100	
·003162	·00001000	50	316·2	100,000	
·002512	$6·310 \times 10^{-6}$	52	398·1	158,500	
·001995	$3·981 \times 10^{-6}$	54	501·2	251,200	
·001585	$2·512 \times 10^{-6}$	56	631·0	398,100	
·001259	$1·585 \times 10^{-6}$	58	794·3	631,000	
·001000	10^{-6}	60	1,000	10^6	
·0005623	$3·162 \times 10^{-7}$	65	1,778	$3·162 \times 10^6$	
·0003162	10^{-7}	70	3,162	10^7	
·0001778	$3·162 \times 10^{-8}$	75	5,623	$3·162 \times 10^7$	
·0001000	10^{-8}	80	10,000	10^8	
·00005623	$3·162 \times 10^{-9}$	85	17,780	$3·162 \times 10^8$	
·00003162	10^{-9}	90	31,620	10^9	
·00001000	10^{-10}	100	100,000	10^{10}	
$3·162 \times 10^{-6}$	10^{-11}	110	316,200	10^{11}	
10^{-6}	10^{-12}	120	10^6	10^{12}	
$3·162 \times 10^{-7}$	10^{-13}	130	$3·162 \times 10^6$	10^{13}	
10^{-7}	10^{-14}	140	10^7	10^{14}	

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